CHP: Recognizing the Environmental Benefits of CHP

Introduction

By now, after a day and a half on this subject of CHP, you've heard much about the environmental, economic, and sustainable development benefits of combined heat and power technologies.

You've also heard reference to the potential combined positive environmental impact--in terms of CO2, NOx, SO2, particulates, and mercury reduced--of significantly accelerating the penetration of CHP in individual countries and regions of the world.

In the first day and a half, you've also heard about the importance of utility, environmental, and tax policies, that allow CHP projects to be appropriately recognized for the environmental benefits of highly efficient, distributed energy sources.

This afternoon, I would like to speak about environmental policies, and specifically air quality regulations, and CHPs role in achieving air quality goals. I have been involved in air quality regulations at the Environmental Protection Agency for over 25 years, and have seen a significant evolution in approaches to air quality regulation over that time period. In particular, I have seen the shift that has taken place in air quality regulation over last decade or more, **away from** prescribing specific technologies that may not be able to reward increased efficiency, **to** performance-based standards, **to** the creation of competitive markets for trading pollution allowances as a means to achieve environmental objectives at the least cost to the economy. I run the division of the U.S. EPA that has administered the SO2 trading program since its establishment under the 1990 Clean Air Act Amendments, and now also administers the NOx trading program established by the Ozone Transport CommissionBa group of 12 Northeastern States.

I will focus my comments today on three areas: <u>One</u>, communicating the perspective of the air quality regulator; <u>Two</u>, recognizing that existing regulatory structures have changed and will continue to change to better encourage efficiency; and <u>Three</u>, identifying potential problem areas that still remain in moving forward with regulatory structures that take better advantage of the benefits of CHP and asking for your help in addressing those areas.

I. Regulatory Perspective

To begin this discussion, it is helpful to remind ourselves of the regulators= perspective of the world. At its most basic level, the problem for air quality regulators is simply, Athe levels of pollutants in the air exceed the standards set to protect public health.@ The regulator then moves from the problem to what is causing the problem, in other words, the emissions going into the air. The next steps for the regulator are to look at who is emitting, how much is being emitted, and what can be done about those emissions.

When I started in this business, limited information on sources and emissions was available. The primary method available to us to determine how much was being emitted was to look at fuel use. After all, in most cases, it was the combustion of fuel that produced the emissions of concern. With our estimates of emissions based on fuel, it was natural to base regulatory regimes on controlling fuel use or the application of specific pollution reducing technologies.

However, **these type of source-specific approaches to reducing emissions rarely rewarded improvements in efficiency. Specifically, these approaches did not allow environmental regulators or sources to take advantage of the benefits that CHP has to offer. As you are aware, CHP is highly efficient in converting fuels to usable energy products (steam, electricity, mechanical power, etc.)** CHP uses substantially less energy to produce the same products (e.g., steam and electricity) as Aseparate heat and power@ technologies B typically between 25% and 50% less. Since it is primarily the combustion of fossil fuels that leads to pollution, using less fuel to make the same products inherently reduces emissions.

Recognizing these benefits, and encouraging them, will certainly lead to less emissions and help us get at least part of the way toward solving our air quality problems.

II. Changes to Incorporate Efficiency

Recognizing that technology-based fuel-specific standards fail to take full advantage of the benefits efficiency could offer, environmental regulators are now moving in the direction of structuring regulations so that they simply and appropriately account for higher efficiency.

To recognize efficient energy conversion, environmental regulation must focus upon performance rather than on fuels and control technology. Performance can be appropriately measured by two factors: pollution emitted and product output. But in order to transition to an enforceable regulatory structure based upon performance, we need to develop effective ways of measuring that performance. As we have developed more effective ways to measure emissions, it has become possible to give credit for efficiency in reducing emissions.

Under this approach, regulations do not concern themselves with how much or what type of fuel is used, or what technology is used to convert the fuel into electricity, thermal energy, cooling, or mechanical power, or what post-combustion technology is employed. Instead, performance-based regulations establish an allowable level of pollution for a project or industrial sector **in total**, or in proportion to some measure of the economic output of the facility, e.g. steam and electricity produced.

Where our measurement techniques allow us to establish a Acap@ on total emissions, we can guarantee that a certain level of environmental performance (in terms of emissions) will be achieved. Under a cap and trade program, such as the programs that have been developed and implemented for SO2 and NOx emissions, energy efficiency is rewarded as sources capture the benefits of reducing emissions regardless of the method used to reduce those emissions.

Where our measurement techniques, or the nature of the sources themselves, do not lend themselves to a cap and trade structure, regulatory programs may still be developed to reward energy efficiency. The term we use for this is an Aoutput-based@ performance standard. **The effect of using output-based performance standards is that pollution prevention (or energy efficiency) is encouraged.**

For example, motor vehicles in this country have been regulated using an output-based standard for over 30 years. The mobile source, grams/mile standards effectively provide an emissions target per unit of output (a mile travelled in this case). Automobile manufacturers may be able to reach that standard by using fuel more efficiently or by installing pollution control devices. Essentially fuel-efficient cars require less add-on technology to achieve the output-based

standards.

To put this in terms more relevant to you, output-based approaches set standards on the basis of pollution emitted per KWH of electricity generated or BTU of thermal energy produced. For example, we have a new standard in the U.S. for electric utility boilers that is set at 1.35 lbs of NOx per megawatt-hour of output. This is in contrast to the approach we have historically taken where we have regulated air emissions on an Ainput-basis,@ where standards were set on the basis of pollution emitted per BTU of fuel used -- for example 0.15 lbs of NOx per million BTUs of heat input.

The effect of an output-based **standard** is that it allows a pollution source, for example a power plant, the flexibility of considering numerous combinations of fuels, efficiency, and combustion and post-combustion control technologies, to meet the standard. In other words, the standard allows the source to emit in proportion to the product it produces and is otherwise completely indifferent (to fuels, technologies, etc.). Importantly, this allows the source to meet the emission standard at the lowest possible cost.

However, the output-based standards still do not guarantee a clean environment. Without a cap, total emissions may still increase as has been the case with motor vehicle emissions.

Therefore, we have recently been looking at ways to incorporate output-based performance standards into market-based cap and trade programs. The effect of an output-based **allocation** approach, within the context of distributing allowances in a capped program, is that a source is given allowances proportional to the amount of electricity generated (or other product output, like thermal or mechanical energy). In contrast, an input-based **allocation** approach, distributes allowances proportional to the amount of fuel consumed, thus providing a more inefficient generator with more allowances than the more efficient generator, when both produce the same outputs. However, unless allowances are periodically reallocated, there is little incentive to change behavior and become more efficient.

Of course, the cap on total emissions provides incentives for energy efficiency regardless of the method of distributing allowances. However, depending upon the allocation method, an output-based allocation for one pollutant, can reward more efficient output going forward and also provide benefits for other pollutants that may not be directly regulated.

So, to reiterate the point, efficient energy conversion can contribute to achieving our air quality goals, and in order to recognize efficient energy conversion, environmental regulation must focus upon performance rather than requiring specific fuels or technologies.

We have made much progress in moving toward environmental regulation based upon mass emission caps and output-based standards, but there is still work to do.

III. Practical Considerations

I will now turn, briefly, to some of the practical considerations in furthering output-based approaches. Specifically, I would like to touch on two areas: developing protocols for measuring output, and how to weight (or whether to weight) multiple outputs.

One of the primary efforts that I have been involved with over the past few years is the development of a regional cap and trade program for NOx. In the process, we have been challenged to evaluate the benefits and logistics of allocating allowances on an output basis. While this effort is not yet complete, we have learned a few things about the practical aspects of output-based allocations, in particular for CHP applications.

What we have found in the process of investigating output allocations, is that measuring energy outputs, instead of inputs, is not more difficult or less accurate, it=s just different. Steam and electricity generation can be measured at least as accurately as fuel input. Because we have used fuel input for regulatory purposes over the past 50 years, we have developed reasonable protocols and data sources for gathering and compiling this information. **Good protocols and data sources can be developed for output data as well, but it takes time and some thoughtful consideration of the technical issues. We are continuing to work on these technical issues, but specifically are interested in your input on what level of accuracy would be appropriate for your competitor to use as he or she competes for a share of the allowances. In the case of output allocations, we are distributing shares of a fixed (or declining) quantity, and it is really the industry which must trust each other to be reporting accurate data.**

As I stated earlier, our traditional reliance on fuel-based regulation came from the limits we faced in terms of measuring performance. We knew how to measure fuel use, and more importantly, we were able to adopt a common unit of measurement across all inputs, i.e., Btus. This common unit of measurement allowed us to treat all inputs equally, whether they were coal, oil, gas, biomass, etc.

Unfortunately, we do not have this common form of measurement when we are looking at output. For example, when we want to assign output-based standards or allocations we still have the problem of how to treat steam relative to electric output. We have heard that the preferred approach for comparing different forms of energy outputs (e.g., steam and electricity) is to <u>avoid it</u> by instead treating CHP the same as if it were SHP (separate heat and power). Trying to Aconvert@ steam to electricity for purposes of applying an output-based approach is problematic at best. Industrial, commercial, and residential facilities use both steam and electricity for different purposes B they are different products. They do not appear to lend themselves to being measured in common terms.

So we are left with trying to establish standards or allocations for emissions from the separate production of steam and electricity and apply them to the multiple outputs of CHP facilities to determine the appropriate standard or allocation. However, while this may be a nice, clean approach in concept, there can be reasons why it may not work easiily or immediately in establishing a new regulatory program.

The short, Atake home@ version is this: <u>output-based approaches in the context of cap and trade programs may eventually be practical and workable, but they will take some time and effort to put in place</u>. And we could use your help.

To summarize my talk this afternoon, I would like to make three points:

First, compared to SHP, CHP provides more useable ouput for the same amount of fuel and emissions, making it more efficient and less polluting.

Second, to recognize this benefit and encourage further efficencies, we are adopting output-based performance standards for new sources in place of old, fuel- or technology-based standards.

Third, we are also trying to incorporate output-based allocations in programs with emssions caps to achieve ancillary environmental benefits.

Thank you for allowing me this opportunity to speak today. I look forward to working with you to solve some of these technical obstacles, and moving forward to fully recognize the benefits CHP has to offer.